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NASA TECH BRIEF

Ames Research Center

Precision, Triple-Parameter, Nondestructive-Test System for In-Process Microwelding

A new triple-parameter system automatically and nondestructively monitors the quality of microwelds produced in the resistance welding of microcircuit intraconnections. Although several other nondestructive methods (e.g., eddy current, weld-joint ohmic resistance, and sonic vibration tests) are available for testing the integrity of welded joints, few are sufficiently reliable for microcircuitry.

The new system simultaneously monitors the weld-pulse voltage, dynamic setdown, and infrared radiation of the weld as it is being formed. Measurements of these parameters give a superior indication of weld integrity in comparison with indications obtained from a single-parameter test system. The attractive features of this system include: minimum complexity, measurement reliability, simple signaling, and no impediment to operator manipulations.

The triple-parameter system consists of a transducer assembly, a sampling subsystem, weld-evaluator circuitry, and an acceptance-limit selector subsystem. The transducer assembly, attached to the welder, consists of a strain gage for measuring dynamic setdown, a photovoltaic cell for measuring infrared radiation, and terminals for permitting the measurement of the pulse voltage at the welding electrodes.

The sampling subsystem contains the circuitry necessary for sampling signals from the transducer assembly and for comparing these signals with reference levels from the acceptance-limit selector. This subsystem also provides the output logic and drive signals for the weld indicator panel. The weld evaluator circuitry consists of the weld-pulse evaluator, setdown evaluator, infrared evaluator, and output logic circuitry. These units sample weld attributes, compare them with the acceptance limits provided by the acceptance-limit selector, and make the decision whether the weld is good or bad.

The output logic circuitry determines the status of the three sampled parameters. If two out of three are beyond established limits, the NO-GO register is set; if only one is outside the acceptance limit, the GO register is set.

Notes:

1. Correlations of the individual parameters during the welding operation with the subsequent quality of the completed weld were established from the results of torsion-shear tests.
2. The following documentation may be obtained from:

   National Technical Information Service
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.95)

   References:
   NASA CR-73207 (N68-21683), Study and Development of Nondestructive Weld Inspection Techniques, Phase I

   NASA CR-73385 (N70-10858), Study and Development of Nondestructive Weld Inspection Techniques, Phase II
3. Requests for further information may be directed to:

   Technology Utilization Officer
   Ames Research Center
   Moffett Field, California 94035
   Reference: B71-10452

(continued overleaf)

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

Patent Counsel
Mail Code 200-11A
Ames Research Center
Moffett Field, California 94035

Source: Walter V. Sterling, Inc.
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